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You will learn 3 ways to express the equation of a line:

#1 slope-intercept form ($y=mx +b$) Section 6.4

m is the slope of the line (rise/run or $(y_2-y_1)/(x_2-x_1)$)

b is the y-intercept (where the line crosses the y-axis)

Example: $y = -2x + 5$

-The slope is -2

-The y-intercept is +5

#2 slope-point form ($y - y_1 = m(x -x_1)$) Section 6.5

m is the slope of the line

x_1 and y_1 are the values from a point (x_1,y_1)

Example: $y - 5 = -3(x + 2)$

-The slope is -3

-The point is $(-2,5)$it looks like it should be +2
but it was subtracting so $x - - 2$ would give $x + 2$.

#3 general form ($Ax +By + C = 0$) Section 6.6

Everything in the equation must be written on the left-side

A must be a whole number (not negative)

B and C must be integers (no fractions/decimals)

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6.5 Slope-Point Form of the Equation for a Linear Function

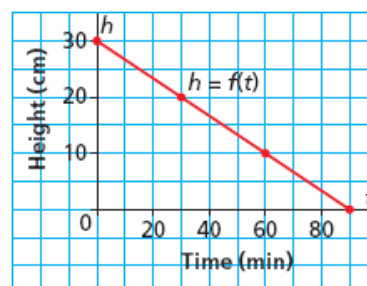


LESSON FOCUS

Relate the graph of a linear function to its equation in slope-point form.

Make Connections

This graph shows the height of a candle as it burns.
How would you write an equation to describe this line?
Suppose you could not identify the h -intercept.
How could you write an equation for the line?

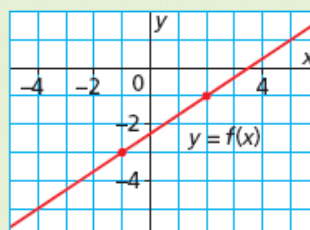


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THINK ABOUT IT

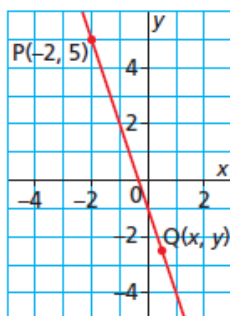
Work with a partner.

Determine an equation for this line.
How many different ways can you do this?
Compare your equations and strategies.
Which strategy is more efficient?



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When we know the slope of a line and the coordinates of a point on the line, we use the property that the slope of a line is constant to determine an equation for the line. This line has slope -3 and passes through $P(-2, 5)$. We use any other point $Q(x, y)$ on the line to write an equation for the slope, m :



$$\text{Slope} = \frac{\text{rise}}{\text{run}}$$

?

?

?

?

?

?

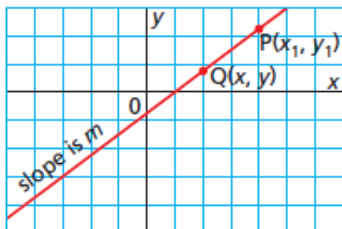
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6.5 Slope-Point Form of the Equation for a Linear Function

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We can use this strategy to develop a formula for the slope-point form for the equation of a line.

Another point on the line is $Q(x, y)$.



The slope, m , of the line is:

?

?

?

?

$$y - y_1 = m \cdot \quad ?$$

?

6.5 Slope-Point Form of the Equation for a Linear Function

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Slope-Point Form of the Equation of a Linear Function

The equation of a line that passes through $P(x_1, y_1)$ and has slope m is:

$$y - y_1 = m(x - x_1)$$

How this form is created:

The slope, m , of the line is:

$$m = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{y - y_1}{x - x_1}$$

$$m(x - x_1) = (x - x_1) \left(\frac{y - y_1}{x - x_1} \right)$$

$$m(x - x_1) = y - y_1$$

$$y - y_1 = m(x - x_1)$$

Example 1

Graphing a Linear Function Given Its Equation in Slope-Point Form

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$$y - y_1 = m(x - x_1)$$

- a) Describe the graph of the linear function with this equation:

$$y - 2 = \frac{1}{3}(x + 4)$$

The "m" (the slope) is 1/3

The x_1 and y_1 (the point) are (-4, +2)?

It must be +2, because it is still (y - 2). It must be -4, because it changed to (x + 4)

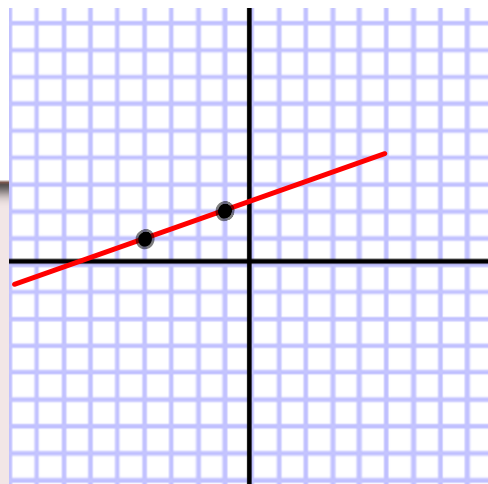
- b) Graph the equation.

First plot the point (-4, 2)

Second plot the slope by plotting the rise and run...draw a line through the two points.



SOLUTION



a Linear Function

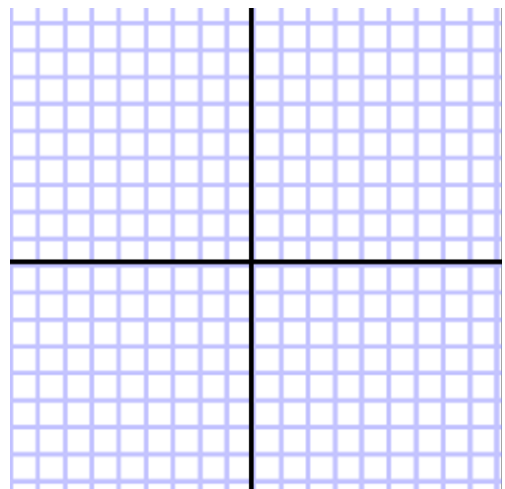
Copy and Complete:

$$y - y_1 = m(x - x_1)$$

1. a) Describe the graph of the linear function with this equation:

$$y + 1 = -\frac{1}{2}(x - 2)$$

- b) Graph the equation.



Example 2

Writing an Equation Using a Point on the Line and Its Slope

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- a) Write an equation in slope-point form for this line.

First, find the slope

The rise is 3

The run is 4

The slope is then $\frac{3}{4}$

Second, choose one point

either $(-1, -2)$ or $(3, 1)$

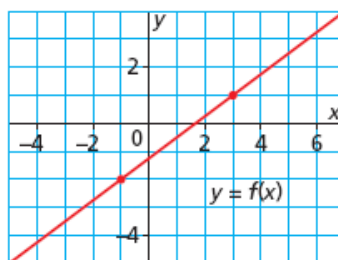
Third, plug in the values into the slope-point equation

$$y - y_1 = m(x - x_1)$$

$$y - (-2) = \frac{3}{4}(x - (-1))$$

Fourth, simplify (get rid of any double negatives)

$$y + 2 = \frac{3}{4}(x + 1)$$



draw a sketch of this diagram in your notes



SOLUTION

Classwork/Homework

Page 372 #4 to 7

Tuesday, December 20th

- Reminder: Chapter 6 Quiz on Thursday (changed from Wednesday)
- Check and go over homework (Pg.372 #4 to 7)
- Go over some more slope-point form equation examples.
- Notes/Practice Questions
- Classwork/Homework

Classwork/Homework

Page 372 #4 to 7



4. For each equation, identify the slope of the line it represents and the coordinates of a point on the line.

a) $y - 5 = -4(x - 1)$

b) $y + 7 = 3(x - 8)$

c) $y + 11 = (x + 15)$

d) $y = 5(x - 2)$

e) $y + 6 = \frac{4}{7}(x + 3)$

f) $y - 21 = -\frac{8}{5}(x + 16)$



4. Coordinates may vary. For example:

a) Slope: -4 ; $(1, 5)$

b) Slope: 3 ; $(8, -7)$

c) Slope: 1 ; $(-15, -11)$

d) Slope: 5 ; $(2, 0)$

e) Slope: $\frac{4}{7}$; $(-3, -6)$

f) Slope: $-\frac{8}{5}$; $(-16, 21)$

6.5 Slope-Point Form of the Equation for a Linear Function

5. Write an equation for the graph of a linear function that:

a) has slope -5 and passes through $P(-4, 2)$

b) has slope 7 and passes through $Q(6, -8)$

c) has slope $-\frac{3}{4}$ and passes through $R(7, -5)$

d) has slope 0 and passes through $S(3, -8)$



5. a) $y - 2 = -5(x + 4)$

b) $y + 8 = 7(x - 6)$

c) $y + 5 = -\frac{3}{4}(x - 7)$

d) $y + 8 = 0$, or $y = -8$



6.5 Slope-Point Form of the Equation for a Linear Function

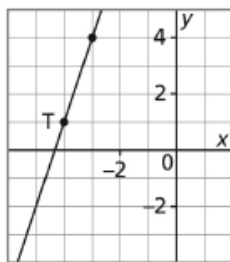


6. Graph each line.

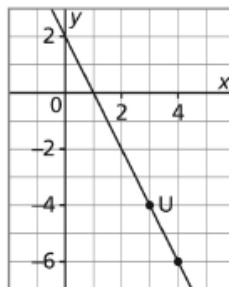
- a) The line passes through $T(-4, 1)$ and has slope 3.
- b) The line passes through $U(3, -4)$ and has slope -2 .
- c) The line passes through $V(2, 3)$ and has slope $-\frac{1}{2}$.
- d) The line has x -intercept -5 and slope $\frac{3}{4}$.



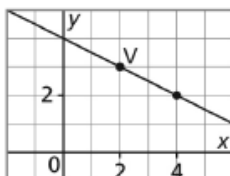
6. a)



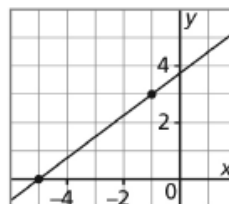
b)



c)



d)



6.5 Slope-Point Form of the Equation for a Linear Function

7. Describe the graph of the linear function with each equation, then graph the equation.

a) $y + 2 = -3(x - 4)$

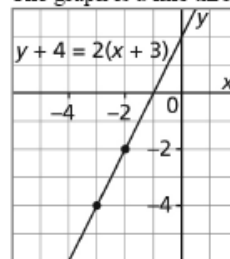
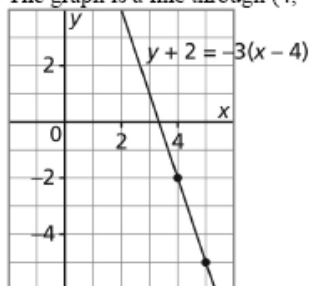
b) $y + 4 = 2(x + 3)$

c) $y - 3 = (x + 5)$

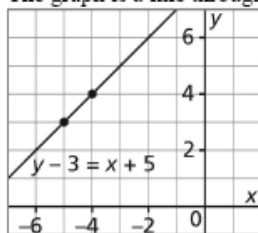
d) $y = -(x - 2)$



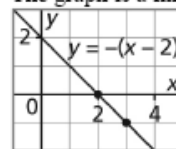
7. a) The graph is a line through $(4, -2)$ with slope -3 . b) The graph is a line through $(-3, -4)$ with slope 2 .



c) The graph is a line through $(-5, 3)$ with slope 1 .



d) The graph is a line through $(2, 0)$ with slope -1 .



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How to change an equation from slope-point form into slope-intercept form:

$$y + 2 = \frac{3}{4}(x + 1)$$

Multiply the right side out:

$$y + 2 = \frac{3}{4}(x + 1)$$

$$y + 2 = \frac{3}{4}x + \frac{3}{4}$$

Now get rid of the 2 on the left,
by subtracting two from both sides.

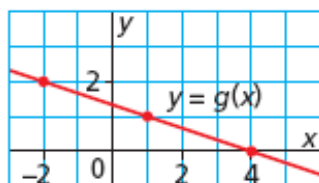
$$y = \frac{3}{4}x - 1\frac{1}{4}$$

*Remember that the 2 must only combine with "like terms", so you will have to subtract it from the $\frac{3}{4}$.

Copy and Complete

$$y - y_1 = m(x - x_1)$$

2. a) Write an equation in slope-point form for this line.
b) Write the equation in part a in slope-intercept form.
What is the y -intercept of this line?



Example 3**Writing an Equation of a Linear Function
Given Two Points**

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 $(-3, 4)$ and $(9, -2)$ x_1, y_1 x_2, y_2

First, find the slope

$$\text{Use } m = \frac{(y_2 - y_1)}{(x_2 - x_1)} \quad m = \frac{(-2) - 4}{9 - (-3)} = \frac{-6}{12} = \frac{-1}{2}$$

Second, fill in the m into the eqn.
and choose one of the points and
fill in the x_1, y_1 .

$$y - (4) = -\frac{1}{2}(x - (-3))$$

Simplify:

$$y - 4 = -\frac{1}{2}(x + 3)$$

Copy and Complete:

Write the equation in slope-point form, using the following two points:
 $(-4, 8)$ and $(2, -8)$

Classwork/Homework

Page 372 #9, 11, 12, 14, 19

Please make sure that you try your best at these questions and help each other out!

Use your notes to help you!

Wednesday, December 21st

- Reminder: Chapter 6 Quiz on Thursday (changed from Wednesday)
- Check and go over homework (Pg.372 #9, 11, 12, 14, 19)
- Complete writing equation worksheet

Extra help offered at lunch hour today

Monday, January 9th

- Reminder: Quiz on writing the equation of a line on Thursday
- Review writing equations (of a line)
- Copy down some notes to help with worksheet
- Complete the writing equation worksheet
(due by Wednesday)
- Look at the last type of equation

Extra help offered at lunch hour Tuesday and Thursday

3 ways to express the equation of a line:

#1 slope-intercept form ($y = mx + b$) Section 6.4

m is the slope of the line (rise/run or $(y_2 - y_1) / (x_2 - x_1)$)

b is the y-intercept (where the line crosses the y-axis)

Example: $y = -2x + 5$

-The slope is -2

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$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

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m is the slope of the line

x_1 and y_1 are the values from a point (x_1, y_1)

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-The slope is -3

-The point is $(-2, 5)$it looks like it should be +2
but it was subtracting so $x - -2$ would give $x + 2$.

$$y - \underline{\quad} = \underline{\quad} (x - \underline{\quad})$$

#3 general form ($Ax + By + C = 0$) Section 6.6

Everything in the equation must be written on the left-side

A must be a whole number (not negative)

B and C must be integers (no fractions/decimals)

copy to help you with your assignment

To create the slope-intercept equation, you need the slope and y-intercept of the line.

-The y-intercept is when $x=0$. $(0, ?)$

- You can find the slope using the formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

To create the point-slope equation, you need to have the slope and any point on the line.

-The point could be the y-intercept $(0, ?)$

-The slope can be found using the formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

#2 To graph an equation, you can do one of the following:

-make a table of values and plot the points

-plot the point or y-intercept, and then plot a second point using the slope of the line.

#5 Reminder:

-Parallel lines have equal slopes

-Perpendicular lines have negative-inverse slopes

Ex -4 and $\frac{1}{4}$
are perpendicular

Ex: slope = 4
y-int = 6
 $y = 4x + 6$

#1 CDE

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$(-1, 4)$ $(5, 6)$
 x_1, y_1 x_2, y_2

$$= \frac{6 - 4}{5 - (-1)} = \frac{2}{6} = \frac{1}{3}$$

Slope-inter
 $y = mx + b$

or

Slope-point
 $y - y_1 = m(x - x_1)$

$$y - 4 = \frac{1}{3}(x - (-1))$$

$$y - 4 = \frac{1}{3}(x + 1)$$

#2 Graph



$$y = 4x - 1$$

4 rise
1 run

$$y = x + 2$$